



## REDUCING GREENHOUSE GAS

With the recent international conference on global warming in Kyoto, Japan, greenhouse gas emissions reduction is back in the news.

Global warming and greenhouse gases are critical issues, and we all need reliable information to make economic and political decisions. The next debate will likely deal with strategies for reducing greenhouse gases worldwide.

When the earth's heat balance is in equilibrium, the amount of energy entering the atmosphere over a period of several years equals that leaving the atmosphere. When more heat is lost than is retained, global cooling occurs. Conversely, when more heat is retained than is lost, global warming takes place.

Heat from the sun, called solar radiation or simply insolation, is a short-wave form of energy that easily enters the earth's atmosphere. Clouds, snow or water may reflect some of this energy back out of the atmosphere. Some also may be absorbed by water and dust in the atmosphere, but the rest reaches the earth's surface.

When the earth receives this short-wave energy, it converts it to infrared heat which is long-wave energy. Long-wave energy reradiated from the earth has much more difficulty leaving the atmosphere because greenhouse gases can absorb the outgoing long-wave energy.

Greenhouse gases in the atmosphere act just as the windshield of a vehicle sitting in a shopping mall parking lot on a hot summer day. Sunlight easily passes

through the windshield, but heat energy is trapped by the glass, creating a greenhouse effect.

There are three known facts about global warming. First, greenhouse gases trap heat in the atmosphere. Secondly, greenhouse gases are increasing in the earth's atmosphere. Thirdly, most of the increase in greenhouse gases during the past 200 years is attributed to anthropogenic, or human, sources, mostly from burning fossil fuels.

What is not known about global warming is exactly where we are located on the earth's natural climatic cycles. Regardless, with few exceptions, scientists agree that the effects of greenhouse gases make the atmosphere warmer than it would be otherwise.

There are three primary greenhouse gases, carbon dioxide, methane and nitrous oxides. Carbon dioxide comes predominantly from burning fossil fuels (coal and oil) and the decay of organic matter. Methane is the natural gas produced in landfills, animal waste lagoons and the digestive tracks of animals. Nitrous oxides come mostly from agricultural fertilizers and from automobiles.

Greenhouse gases do not have the same warming potential. Carbon dioxide is used as a standard to compare the effects of other greenhouse gases. For example, one t o n

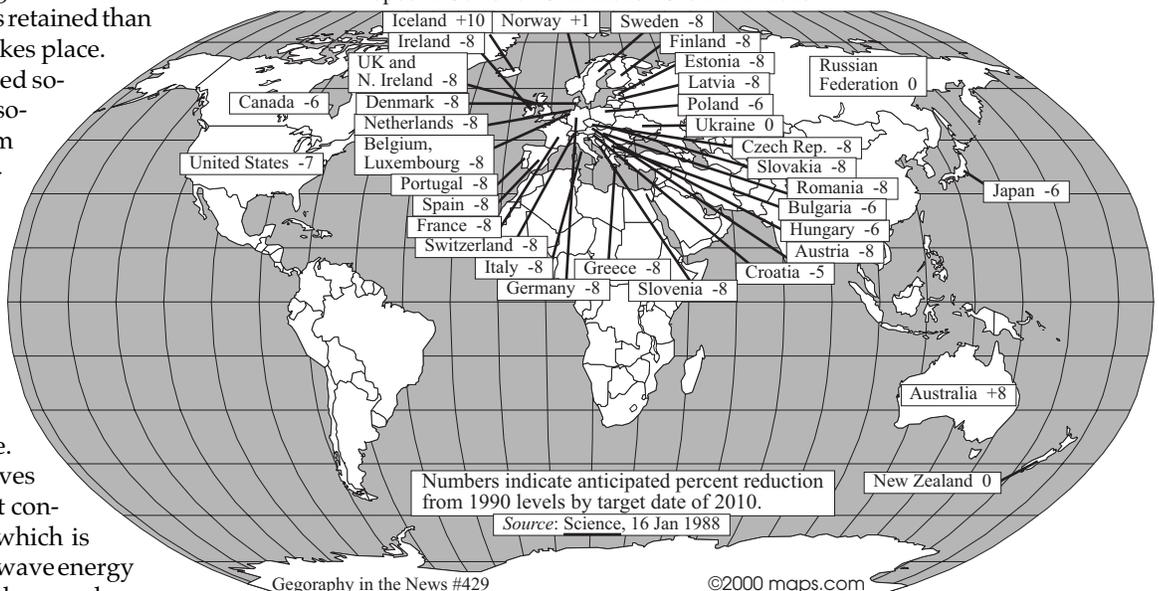
represent 84 percent of the total U.S. GWP, methane represents 13 percent and nitrous oxides are 3 percent.

According to general agreements at Kyoto, the United States will be expected to lower its greenhouse gas emissions by year 2010 to 7 percent below 1990 emissions. Our emissions have continued to climb since 1990, so this appears to be an incredibly high expectation. Iceland with its thermal energy source, Norway with abundant hydroelectric power, and Australia with its low energy use are exceptions, but most other developed countries have reduction requirements similar to the United States.

The next step is to search for mitigation strategies to reduce emissions. Many will be economically advantageous, such as increasing the use of insulation in homes or switching from fuel oil to natural gas for home heating. Others will be new technologies, some involving old sources of emissions-free energy such as solar and wind, while others will involve higher efficiency electrical motors and automotive vehicles.

Of particular interest will be reduction incentive programs, trading of emissions credits between countries, and a host of new ideas to increase fuel efficiencies and energy savings. These strategies make economic as well as environmental sense.

Proposed Goals for Greenhouse Gas Reductions



of carbon dioxide has a global warming potential (GWP) of 1.

Methane, on the other hand, has 21 times more warming potential than carbon dioxide, so its GWP is 21. Nitrous oxide has a GWP of 300.

U.S. emissions of carbon dioxide rep-

And that is Geography in the News, February 5, 1998.

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